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AUTHOR Bragman, Ruth
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ABSTRACT

The investigation studied the effects of different methods of conveying test instructions on the performance of 54 deaf children (6 to 8 years old) on pattern recognition tasks. Ss were randomly assigned to one of three methods of conveying test instructions: simultaneous communication method, pantomime method, and demonstration method. Ss were then presented with pattern recognition tasks with directions conveyed according the group assignment. Results indicated that different methods of conveying test instructions significantly affected the performance of deaf children on pattern recognition tasks. Results suggested that the three methods are not interchangeable nor is one method superior but that the different methods are necessary for different types of assessment and for different levels of language ability. Statistical data are attached. (Author/DB)

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Deaf Children's Performance on Pattern Recognition Task: Effects of Different Methods of Conveying Test Directions on Performance

Ruth Bragman
Memphis State University
Department of Special Education and Rehabilitation
College of Education
Memphis, Tennessee 38152

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Abstract

The purpose of this investigation was to study the effects of different methods of conveying test instructions on the performance of deaf children on pattern recognition tasks. Three methods of conveying test instructions were used: simultaneous communication method, pantomime method, and demonstration method. Fifty-four deaf subjects aged 6.0 years to 8.0 years were randomly assigned to one of the three methods. Subjects were then presented with pattern recognition tasks with directions conveyed according to group assignment. Results indicated that (1) different methods of conveying test instructions significantly effected the performance of deaf children on pattern recognition tasks (2) no post hoc contrasts were found to be significant on the identical pattern recognition tasks (3) post hoc contrasts found demonstration method to be significantly higher on the reverse pattern recognition tasks. Results suggest that the three methods are not interchangeable.

Deaf Children's Performance on Pattern Recognition Tasks: Effects of Different Methods of Conveying Test Directions on Performance

The attempt to determine a non-discriminatory method of evaluating deaf individuals has a long history (Vernon, 1968). The majority of the studies on methods to assess deaf persons drew attention to the fact that the instruments used must have non-verbal performance type responses and must also contain non-verbal directions (Berlinsky, 1952; Braen & Masling, 1959; Gerweck & Ysseldyke, 1975; Glowatsky, 1969; Goetzinger, Wills & Dekker, 1967; Hoemann & Ullman, 1976; Reed, 1970; Vernon & Brown, 1964).

Currently there is an increased awareness of the need for non-discriminatory testing and evaluation of handicapped children. Public Law (P.L.) 94-142 in section 121a530 states that "...testing and evaluation materials and procedures utilized for the purposes of evaluation and placement of handicapped children will be selected and administered so as not to be racially or culturally discriminatory." (Federal Register, August 23, 1977 p. 42496). This point is further highlighted in Section 121a532 which states that "testing and evaluation materials are provided and administered in the child's native language or other mode of communication, unless it is clearly not feasible to do so (Federal Register, August 23, 1977 p. 42496). The law however does not specify requirements for testing a child in his or her native language nor the procedures which are to be used in developing, administering and interpreting such measures (Mercer, 1979). Research related to the

appropriate language or mode of communication to be used in test instruction with deaf children has been limited (LeNard & Trybus, undated; Levine, 1971; Reed, 1970; Trybus, 1979; Sattler & Theye, 1967). This issue is confounded when combined with the following statement in Section 121a532 of the Federal Register that tests and other evaluation materials "...have been validated for the specific purpose for which they are used" (Federal Register, August 23, 1977 p. 42496). Literature in the area of assessment has often stated that any change in testing procedures may cause the test to become invalid for the purpose it was developed (Gerwick & Ysseldyke, 1975; Mercer, 1979; Newland, 1971; Page, 1979; Sattler, 1974; Ysseldyke, 1979). There are no research investigations of the changes in test validity with deaf children when different levels of language are used in test instructions. The main purpose of tests is to determine the real needs of the child in order to develop appropriate educational programs (Jones, 1979; LeNard & Trybus, undated; Mercer, 1979; Page, 1979; Ysseldyke, 1979). It is, therefore, critical that research is done that will determine the method of conveying test instructions most appropriate for use in assessing the deaf child and the effects the use of different methods conveying test instructions have on the test performance and the validity of the test.

This investigation was designed to provide data that would be useful in determining the appropriate method of conveying test instructions for the deaf child. This study may also help in developing procedures to be used in administering tests to the deaf child and the interpretation of the test scores.

The development of appropriate directions for deaf children has focused on three methods of conveying directions: simultaneous communication method, pantomime method, and demonstration method. All three methods of instructions try to convey the task demands without revealing the desired response to the child (Reed, 1970).

This investigation explored the relationship among these three methods of conveying directions and their effects performance of deaf children on pattern recognition tasks. These methods were seen to rely, by varying degrees, on standard symbols and rules of language for the presentation and interpretation of the task demands. Each method was defined as a different level of language.

Simultaneous communication method, derived from the current philosophy of total communication, was seen as the highest level of language (direct language based method) (Trybus, 1979). Simultaneous communication method incorporates standard symbols and rules of language in the presentation and interpretation of the task demands. Pantomime method, one of the most common methods for conveying test instructions to deaf children, was seen as the intermediate level of language (indirect language based method) (Reed, 1970). Pantomime possibly contains a verbal component and is indirectly influenced by standard symbols and rules of language for the presentation and interpretation of the task demands. Demonstration method, a recent modification frequently used in learning and research studies, was seen as the lowest level of language (non-language based method) (Conrad, 1970; Karchmer & Belmont, 1976; Neuhaus, 1967; Reed, 1970; Rittenhouse, 1977; Sattler, 1974; Trybus, 1979). Demonstration method focuses on task strategy and

appears to be independent of standard symbols and rules of language for the presentation and interpretation of the task demands.

In addition this investigation explored the possible effects that the hearing status of the parents of the deaf child may have on performance on pattern recognition tasks. It has often been found that deaf children with deaf parents perform better on standardized tests than deaf children with hearing parents (Brill, 1970; Jensema & Trybus, 1978; Meadow, 1966, Stuckless & Birch, 1966; Vernon & Koh, 1970; 1971).

The purpose of this study was to investigate the effects of different methods of conveying test instructions on the performance of deaf children on pattern recognition tasks. Related to this the effects of the hearing status of the deaf child's parents on the performance of the child on pattern recognition tasks was explored. This study also investigated the possibility of an interaction effect of age of the child, method of conveying test instructions, and hearing status of the parents of the deaf child, on performance on pattern recognition tasks.

Three research questions were explored: 1. Will different methods of conveying test instructions change the performance of deaf children in pattern recognition tasks? 2. Will the hearing status of the parents of the deaf child affect the child's performance in pattern recognition tasks? 3. Will the age of the deaf child, the hearing status of his or her parents, and the method of conveying test instructions interact to affect performance of the child in pattern recognition tasks?

Methodology

Subjects

Fifty-four prelingually deaf children, ranging in age from 6 years, 0 months to 8 years 0 months, were selected for this study. Subjects came from nine state funded residential schools for the deaf, in six Mid-Atlantic states. All the schools used in this study accepted the philosophy of total communication and used the total communication method for classroom instructions.

Subjects had no other handicaps and were within the normal intelligence range as determined by the classroom teacher and principal of the respective schools (Montgomery, 1975; Musgrove & Counts, 1975). The hearing status of both parents of each child was obtained by a questionnaire answered by the parents. Six subjects had both parents deaf, no subject had one parent deaf, and forty-eight subjects had both parents with normal hearing.

Instrument

A pattern recognition task was developed for this investigation. This instrument met the following criteria: 1. The different methods of conveying test instructions could be used for the directions to these tasks and all methods (levels of language) "seemed" to convey the same task demands. Differences in performances on these tasks due to different methods could be explored. 2. Pattern recognition tasks are components of many intelligence tests and require non-verbal responses (Leiter, 1959; Raven, 1956; Thurstone, 1938; Wechsler, 1972).

3. Previous research dealing with pattern recognition tasks with deaf children revealed the possibility of difficulty in task performance was due to the directions (Bragman & Hardy, 1979).

The instrument consisted of twenty model sequence pattern cards, 3 by 11 inches, and twenty corresponding choice sequence pattern cards, 14 by 11 inches. Each card was 6-ply, white poster board and covered with clear contact paper. Each pattern was made up of 1 inch squares of colored paper as the dimension. Four patterns, five cards each, were used. ABAB, ABCABC, AABAAB, ABBABB. The model pattern card had a model pattern sequence represented by the colored squares and on the reverse side of the model sequence card the reverse pattern was represented by colored squares. On the choice pattern cards four choise pattern sequences were presented. On each choice card one of the four choice pattern sequences was identical to the corresponding model pattern sequence, one was the reverse of the model pattern sequence, and the other two were randomly selected patterns that included only those colors given in the model sequence. All choice sequences were randomly placed on the cards. The model sequences were placed 2 inches to the left of the choice pattern sequence cards and 5 1/2 inches down from the top of the first choice sequence as shown in Figure 1. Cards were randomly ordered. Four practice cards for each task in addition were developed.

Insert Figure 1 about here

Examiners

The examiners were selected by the school administration at each school. All examiners were experienced with the use of total communication method as a means of instruction and had at least one year

experience in working with deaf children. All examiners were female. The examiners were all familiar with the children, however, they were not directly involved with the classroom instruction of the children participating in the study. Each examiner, along with the researcher, determined which signs to use for the simultaneous communication method to convey the test instructions. The examiners were also trained in the administration of the Dvorine Pseudo-Isochromatic Plates.

Treatment

Subjects, using random counterbalanced assignment, were assigned to one of the three treatment groups. Each treatment group represented a different method of conveying test instruction (level of language). The three groups were: simultaneous communication method, pantomime method, and demonstration method. In addition subjects, using random counterbalanced assignment were assigned to one of two orders of presentation of tasks.

Each subject was given the Dvorine Pseudo-Isochromatic Plates, four practice cards on the pattern recognition task he or she was to perform first, the first pattern recognition tasks, a five minute break, four new practice cards on the second pattern recognition task, and finally, the second pattern recognition task. All directions to the pattern recognition tasks were given according to the treatment group the subject was assigned. Testing took between 30-45 minutes per subject.

Analysis

Coefficient alpha was first estimated for each pattern recognition task within each method of conveying test instructions and across all

methods on each pattern recognition task to determine if internal reliability was sufficient to use this instrument for the investigation. A two-way multivariate analysis of variance design was then used to determine if different methods of conveying test instructions effected the performance of deaf children on pattern recognition tasks. Age was a covariate. Order of presentation of tasks and method of conveying test instructions were the independent variables. Scores on the identical pattern recognition task and scores on the reverse pattern recognition task were the dependent variables. When significant multivariate F ratios were obtained, specific univariate F ratios were inspected. If specific univariate F ratios were significant specific contrasts were developed for the relationships among the various methods of that variable and tested for significance by use of Scheffe post hoc procedure. No statistical procedures were used to determine if there was an effect on performance on pattern recognition task of deaf children due to the hearing status of the child's parents because of the small number of subjects with both parents deaf (n=6). No statistical procedures were used to determine if there was an effect on performance on pattern recognition tasks of deaf children due to interaction of the age of the child, hearing status of his or her parents and the method of conveying test instruction because of the small number of subjects with both parents deaf. Analysis of covariance was used to determine if there was an interaction effect between the age of the child and the method of conveying test instructions for each pattern recognition task.

Results

The coefficient alphas, means and standard deviations at each method of conveying test instructions and for the total group for each pattern recognition test are given in Table 1.

Insert Table 1 about here

While there are no-hard-and fast rules as to what is a high reliability, for research purposes one can tolerate levels as low as .50 (Guilford, 1954). From inspection of Table 1 it can be noted that the lowest coefficient alpha was.682 well above the .50 suggested by Guilford. For the purposes of this study the internal reliability was therefore found to be sufficient to use this instrument for the investigation of the effects of methods of conveying test instructions on performance in pattern recognition tasks.

A significant multivariate F was found for the effects on performance due to the method of conveying test instructions as shown in Table 2. Significant univariate Fs were found, on each pattern recognition task, due to method of conveying test instructions as shown in Table 3. Using the Scheffe procedure significant differences were found in performance for the following specific contrasts as shown in Table 4. For the identical pattern recognition task significant differences were not found among pantomime methods, demonstration method and simultaneous communication method. For the reverse pattern recognition task significant differences were found between: simultaneous communication method and demonstration method; pantomime method and demonstration method; and the average of simultaneous communication method and pantomime method against

demonstration method. No sifnificant multivariate Fs were found for the effects due to age, effects due to order of presentation of tasks, or effects due to interaction between the order of presentation of tasks and method of conveying in test instructions as shown in Table 2. No significant Fs were found due to interaction between age of the subject and method of conveying test instructions for either identical or reverse pattern recognition tasks. (F=.345, p=.882 and F=2.051, p=.091, for the identical and reverse pattern recognition task respectively).

Insert Table 2, Table 3 and Table 4 about here

Discussion and Conclusions

When the task and the language used in test instructions were familiar to the subjects, as in the identical pattern recognition task, performance was similar for demonstration method, simultaneous communication method and pantomime method. When the task and the language used in test instructions were unfamiliar to the subjects, as in the reverse pattern recognition task, performance was similar for the simultaneous communication method and pantomime method. Performance, however, was signficantly improved when directions were given in demonstration method.

Based on observations made during the administration of the pattern recognition tasks it was felt that the different methods of conveying instructions changed the task demands. Simultaneous communication method demanded that the subject be able to recognize the signs and abstract the meaning of the signs before the task could be attempted. Pantomime method demanded that the subject be able to focus his or her attention to unfamiliar hand gestures and abstract meaning from these gestures

before the task could be attempted. Demonstration method demanded that the subject be able to copy the directions before the task could be attempted.

The combined statistical and observational findings give strong support for the importance of standardization of test directions for deaf children. They further support the need for more than one set of directions for each task. The selection of appropriate directions for any child must be based on that child's ability to understand the language of the instructions. It is critical that each set of directions developed has its own norms and interpretation of the test scores. The interpretation needs to be based on the possible changes in the task demands due to the specific test instructions.

For the tasks used in this study it is felt that two sets of directions are necessary: simultaneous communication method and demonstration method. Pantomime is felt to be similar to simultaneous communication method of giving directions for the young deaf child. Pantomime was not found to effect performance if the child was familiar with the task and the signs used in the directions. At the same time pantomime did not improve performance if the child was not familiar with the task and the signs used in the directions.

A recommended procedure for use in testing the deaf child is one that introduces the test direction set with the highest level of language first followed by directions with lower levels of language, if necessary. This procedure is recommended because of the possibility that learning may confound the results. If the child does not understand

the directions when a high level of language is used the examiner must move as quickly as possible to directions with a lower level of language, so as not to frustrate the child.

Specifically for the pattern recognition tasks used in this study the following procedure is recommended. The child should first be given the directions by use of simultaneous communication. If the child understands the directions, then the norms and interpretation developed for simultaneous communication directions should be used. If the child cannot understand the directions then they should be given to the child by use of demonstration and the norms and interpretations developed for demonstration method should be used. If one wants to teach the task then one could begin with the demonstration, use demonstration and simultaneous methods together, and finally use only simultaneous. In the testing situation however, it is critical that the methods not be combined. Any combination of the methods may confound the results; i.e., is the child able to abstract the meaning from the sign or is the child only able to copy the directions?

In summary this study found that different methods of conveying test instructions effect deaf children's performance on pattern recognition tasks. Further it maintains that these different directions cannot be interchanged. One method is not seen as superior to another but the different methods appear to have different effects on performance and are necessary for different types of assessment. The level of language to be used in test instructions is dependent on the communication skills of the child being tested.

This study supports the necessity to develop standard test instructions using different methods of conveying test instruments of different levels of language for the assessment of the deaf child. It cannot be assumed that the best test instructions are those given in the mode of communication commonly used by the deaf child nor that different levels of language used in instructions can be interchanged or combined. A minimum of two sets of directions needs to be developed: simultaneous communication method and demonstration method. Since the method of conveying test instruction and the level of language used in test instructions effects the child's performance and the meaning of the test scores, each set of instruction developed must have its own norms and interpretations. It is essential that the method of conveying test instructions be analyzed for possible changes in item difficulty and task demands. This analysis is critical so that the deaf child is not penalized for his or her handicap and the specific needs of the child can be identified.

The generalizability of the implication mentioned is limited. This investigation used limited subjects, test items, testing situations, examiners, and methods of conveying instructions. Further research is necessary to determine if the results of this study are consistent for deaf and hearing impaired children of other ages, for deaf and hearing impaired children with different ages of onset of hearing loss, and for deaf and hearing impaired children with different degrees of hearing loss and if the results of this study are consistent with different types of items, especially those test items most commonly used in assessment of the deaf and hearing impaired child. Future investigations

are also necessary to ensure correct educational placement of hearing impaired children.

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Figure 1

Pattern Recognition Task Card Placement

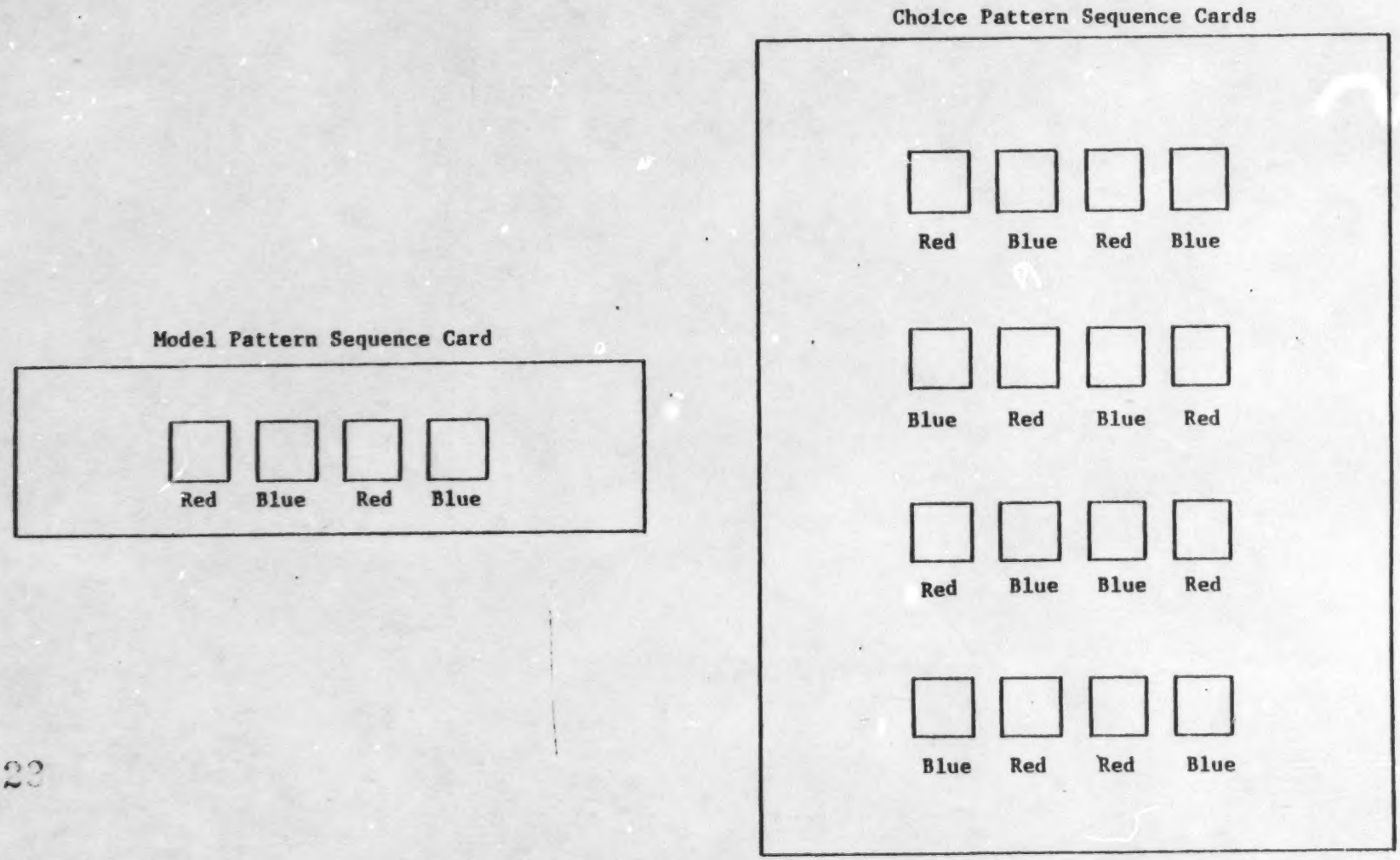
Choice Pattern Sequence Cards
Red Blue Red Blue
Blue Red Blue Red
Red Blue Blue Red
Blue Red Red Blue
Model Pattern Sequence Card
Red Blue Red Blue

Table 1

Coefficient Alphas, Means and Standard Deviations for Identical and Reverse Pattern Recognition Tasks by Level of Language

	Method of Conveying Test Instruction			
	Simultaneous	Pantomime	Demonstration	Total
Identical				
Coefficient Alpha	.781	.909	.682	.871
Mean	18.111	16.222	18.833	17.722
Standard Deviation	2.514	4.673	1.708	3.402
Number of Subjects	18	18	18	54
Reverse				
Coefficient Alpha	.948	.959	.889	.949
Mean	6.222	7.500	13.278	9.000
Standard Deviation	7.520	7.104	5.226	7.037
Number of Subjects	18	18	18	54

Table 2

Multivariate Analysis of Variance for Identical and Reverse Pattern Recognition Tasks

Source	DF	F	p
Age (A)	2,46	3.014	.059
Method of Conveying Test Instructions (M)	4,92	4.546	.002*
Order of Presentation of Tasks (O)	2,46	.177	.838
M X O	4,92	1.752	.145

*$p < .05$

Table 3

Univariate Analysis of Covariance for Identical and Reverse Recognition Tasks

Source	DF	MS	F	p
Identical				
Age (A)	1	60.243	6.153	.017*
Method of Conveying Test Instructions (M)	2	35.150	3.590	.035*
Order of Presentation of Tasks (O)	1	2.598	.265	.609
M X O	2	11.817	1.207	.308
Error	47	10.840		
Reverse				
Age (A)	1	.003	.001	.978
Method of Conveying Test Instructions (M)	2	254.148	6.164	.004*
Order of Presentation of Tasks (O)	1	4.573	.111	.741
M X O	2	109.320	2.651	.081
Error	47	40.376		

* $p < .05$

Table 4

Post Hoc Contrasts for Different Methods of Conveying Test Instructions for Identical and Reverse Pattern Recognition Tasks

Contrast	Identical Pattern Recognition F	Reverse Pattern Recognition F
Simultaneous Contrasted With Pantomime	3.522	.362
Simultaneous Contrasted With Demonstration	.307	11.088**
Pantomime Contrasted With Demonstration	5.910	7.445*
Simultaneous and Pantomime Contrasted With Demonstration	2.970	12.235***
Simultaneous and Demonstration Contrasted With Pantomime	6.186	1.508

*$p < .05$

**$p < .01$

***$p < .005$

Tests Commonly Used With The Deaf And The Hard of Hearing

Test	Type*	Author(s)	Date	MMY
Arthur Adaption of the Leiter International Performance Scale	1,4	G. Arthur	1942-55	6-526
Arthur Point Scale of Performance Tests: Form 2	1,4,6	G. Arthur	1947	4-335
Bender-Gestalt Test (Visual Motor Gestalt Test)	3,4,6	L. Bender	1938	7-161
Columbia Mental Maturity Scale	1,4	B. Burgemeister L. Blum L. Lorge	1954-72	8-210
Goodenough-Harris-Draw-A-Person	1,4,6	F. Goodenough D. Harris	1927-63	7-352
Hiskey-Nebraska Test of Learning Aptitude	1,5,7,8	M. Hiskey	1941-66	8-217
House-Tree-Person	3,4,6	J. Buck I. Jolles	1946-66	6-215
Leiter International Performance Scale	1,4	G. Leiter	1948	5-408
Merrill Palmer Scale of Mental Tests	1,4,6	R. Stutsman	1926-31	6-527

*Key at end of Table

Machover Draw-A-Person Test	3,4,6	K. Machover	1949	8-606
Progressive Matrices	1,4,6	J. Raven	1938-65	7-376
Randell Island Performance Scale	1,4,7	L. Poull A. Bristol H. King L. Peatman	1931-53	no review out of print
Rorschach (Psychodiagnostic Plates)	3,4,6	H. Rorschach	1921-51	8-661
Sixteen Personality Factors Questionnaire	3,4	R. Cattell H. Eber M. Tatsuoka	1949-76	8-679
Stanford Achievement Tests	2,4,6	R. Madden E. Gardner H. Rudman B. Karlsen J. Merwin	1923-75	8-[illegible]9
Stanford Achievement Test, Special Edition	2,4,7,8	Office of Demographic Studies, Gallaudet College	1973-74	no review
Thematic Apperception Test	3,4,6	H. Murray	1935-43	8-697
Wechsler Adult Intelligence Scales-Performance Scales	1,4,6	D. Wechsler	1939-55	7-429
Wechsler Intelligence Scales for Children-Performance Scales	1,4,7,8	D. Wechsler	1949	7-431

*Key at end of Table

Wechsler Intelligence Scales for Children-Revised Performance Scales	1,4,6	D. Wechsler	1974	8-232
Wechsler Preschool and Primary Scales of Intelligence	1,4,6	D. Wechsler	1967	7-434
Wide Range Achievement	2,4,6	J. Jastak S. Jastak S. Bijou	1940-76	7-36

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*1 Intelligence Test
2 Achievement Test
3 Personality Test
4 Developed for Hearing Populations
5 Developed for Deaf and Hard of Hearing Populations
6 Modification of Test Administration Necessary with Deaf and Hard of Hearing Populations
7 Standard Modification of Test Administration Available for Deaf and Hard of Hearing Populations
8 Norms Available for Deaf and Hard of Hearing Populations